TETRA TECH

May 30, 2012

Mr. Roy Crossland
START Project Officer
U.S. Environmental Protection Agency, Region 7
8600 NE Underground Drive, Pillar 253
Kansas City, Missouri 64161

Subject: Quality Assurance Project Plan
Atlantic Water Supply Site, Atlantic, Iowa
U.S. EPA Region 7, START 3, Contract No. EP-S7-06-01, Task Order No. 0278
Task Monitor: Susan Fisher, EPA On-Scene Coordinator

Dear Mr. Crossland:

Tetra Tech EM Inc. is submitting the attached Quality Assurance Project Plan for Removal Assessment activities at the Atlantic Water Supply site in Atlantic, Cass County, Iowa. If you have any questions or comments, please contact David Zimmermann at (816) 412-1788.

Sincerely,

David Zimmermann, CHMM
START Project Manager

Ted Faile, PG, CHMM
START Program Manager

Enclosures

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X9004.12.0278.000

QUALITY ASSURANCE PROJECT PLAN
FOR A REMOVAL ASSESSMENT
ATLANTIC WATER SUPPLY SITE
ATLANTIC, IOWA

CERCLIS ID: IAD039954300

Superfund Technical Assessment and Response Team (START) 3 Contract
Contract No. EP-S7-06-01, Task Order 0278

Prepared For:

U.S. Environmental Protection Agency
Region 7
Superfund Division
901 North 5th Street
Kansas City, Kansas 66101

May 30, 2012

Prepared By:
Tetra Tech EM Inc.
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CONTENTS

APPENDICES

Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (July 2007)
for the Atlantic Water Supply Site

Project Information:

Site Name: Atlantic Water Supply Site		**City:** Atlantic	**State:** Iowa
EPA Project Manager: Susan Fisher		**START Project Manager:** David Zimmermann	
Approved By:	5-30-2012	**Prepared For:** EPA Region 7 Superfund Division	
Title: START Project Manager	Date:		
Approved By:			
Title: START Program Manager	Date: 5-30-2012		
Approved By:		**Prepared By:** David Zimmermann **Date:** May 2012	
Title: for START QA Manager	Date: 5-30-2012		
Approved By:			
Title: EPA Project Manager	Date:	Tetra Tech START Project Number: X9004.12.0278.000	
Approved By:			
Title: EPA Region 7 QA Manager	Date:		

1.0 Project Management:

1.1 Distribution List

EPA—Region 7: Susan Fisher, EPA On-Scene Coordinator
Diane Harris, Region 7 QA Manager

START: David Zimmermann, Project Manager

1.2 Project/Task Organization

Susan Fisher, of the EPA Region 7 Superfund Division, will serve as the EPA Project Manager for the activities described in this QAPP. David Zimmermann, of Tetra Tech EM Inc., (Tetra Tech), will serve as the START Project Manager.

1.3 Problem Definition/Background:

Description: This site-specific Quality Assurance Project Plan form is prepared as an addendum to the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007), and contains site-specific data quality objectives for the sampling activities described herein.

☒ Description attached.

☐ Description in referenced report: _____ Title _____ Date

1.4 Project/Task Description:

☐ CERCLA PA ☐ CERCLA SI ☐ Brownfields Assessment
☐ Other (description attached): ☐ Pre-CERCLIS Site Screening ☒ Removal Assessment

Schedule: Field work is anticipated to occur in June 2012.

☐ Description in referenced report: _____ Title _____ Date

1.5 Quality Objectives and Criteria for Measurement Data:

Accuracy:	☒ Identified in attached table.
Precision:	☒ Identified in attached table.
Representativeness:	☒ Identified in attached table.
Completeness*:	☒ Identified in attached table.
Comparability:	☒ Identified in attached table.

Other Description:

*A completeness goal of 100 percent has been established for this project. However, if the completeness goal is not met, EPA may still be able to make site decisions based on any or all of the remaining validated data.

1.6 Special Training/Certification Requirements:

☒ OSHA 1910
☒ Special Equipment/Instrument Operator: Field staff will require training in the operation of the EPA Geoprobe®, as well as associated tools such as the electric conductivity (EC) logging tool and membrane interface probe (MIP).
☒ Other (describe below): Groundwater samples will be analyzed in the field by EPA personnel using a HAPSITE portable gas chromatograph/ mass spectrometer (GC/MS).

Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (July 2007)
for the Atlantic Water Supply Site

1.7 Documentation and Records:

☒ Field Sheets ☒ Site Log ☐ Trip Report ☒ Site Maps ☐ Video
☒ Chain of Custody ☒ Health and Safety Plan ☒ Letter Report ☒ Photos

☒ Sample documentation will follow EPA Region 7 SOP 2420.05.

☒ Other: Analytical information will be handled according to procedures identified in Table 2.

2.0 Measurement and Data Acquisition:

2.1 Sampling Process Design:

☐ Random Sampling ☐ Transect Sampling ☒ Biased/Judgmental Sampling ☐ Stratified Random Sampling
☐ Search Sampling ☒ Systematic Grid ☐ Systematic Random Sampling ☐ Definitive Sampling
☐ Screening w/o Definitive Confirmation ☒ Screening w/ Definitive Confirmation
☒ Sample Map Attached

The proposed sampling scheme for groundwater collection will be biased/judgmental, while soil sampling will incorporate a systematic grid. Both soil and groundwater will be field screened, with a portion submitted for definitive laboratory analysis, in accordance with procedures included in the *Guidance for Performing Site Inspections Under CERCLA*, OSWER Directive #9345.1-05, September 1992, and *Removal Program Representative Sampling Guidance, Volume 1: Soil*, OSWER Directive 9360.4-10, November 1991. All samples will be submitted for analysis by the EPA Region 7 laboratory. See Appendices A and B for additional site-specific information and maps. The proposed number of samples is a balance between cost and coverage, and represents a reasonable attempt to meet the study objectives while staying within the budget constraints of typical removal support activities.

Sample Summary Location	Matrix	# of Samples*	Analysis
Groundwater – temporary monitoring wells or piezometers	Water	35	On-site VOC analysis (HAPSITE)
Groundwater – temporary monitoring wells or piezometers	Water	8	VOCs
Suspected source areas	Soil	20 profiles	VOCs (membrane interface probe)
Suspected source areas	Soil	10	VOCs

*NOTE: Background/QC samples are not included with these totals. See Table 1 for a complete sample summary.

2.2 Sample Methods Requirements:

Matrix	Sampling Method	EPA SOP(s)/Methods
Water – Temporary monitoring wells or piezometers	Groundwater samples will be collected from existing piezometers or Geoprobe® temporary monitoring wells. A piezometer will be sampled using a disposable bailer. Geoprobe® groundwater samples will be collected through the rods via disposable polyethylene tubing and a check valve.	EPA SOPs 4230.07 and 4231.2007
Soil at the suspected source areas.	After screening with the MIP, soil samples will be collected with Geoprobe® macro-core samplers using a stop-pin system. Samplers will be equipped with polyvinyl chloride (PVC) liners and, upon collection, soil will be transferred to the appropriate sample containers.	EPA SOP 4230.07; Method 5035

2.3 Sample Handling and Custody Requirements:

☒ Samples will be packaged and preserved in accordance with procedures defined in Region 7 EPA SOP 2420.06.
☒ COC will be maintained as directed by Region 7 EPA SOP 2420.04.
☒ Samples will be accepted according to Region 7 EPA SOP 2420.01.

☐ Other (Describe):

2.4 Analytical Methods Requirements:

☒ Identified in attached table.
☒ Rationale: The requested analyses have been selected based on the historical information on the site and program experience with similar types of sites.
☐ Other (Describe):

Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (July 2007)
for the Atlantic Water Supply Site

2.5 Quality Control Requirements:

☐ Not Applicable
☒ Identified in attached table.
☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
☒ Describe Field QC Samples: For this investigation, field QC samples will include one field blank (water) and one equipment rinsate blank (water), both prepared with deionized (DI) water provided by the EPA Region 7 laboratory. The field blank will be collected to evaluate contamination of sampling containers and/or preservatives, and to assess contamination potentially introduced during the sampling and laboratory procedure(s). The equipment rinsate will evaluate the effectiveness of decontamination procedures for monitoring well sampling equipment. In addition, one water trip blank will be prepared by the EPA Region 7 laboratory and be used to evaluate contamination introduced during transportation of the containers/samples. Evaluation of blank samples depends on the levels of contamination found in environmental samples to determine whether the environmental samples are representative. Analytical results of blank samples will be evaluated on a qualitative basis by the EPA Project Manager and EPA contractor(s) to determine a general indication of field-introduced and/or lab-introduced contamination.

☐ Other (Describe):

2.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements:

☐ Not Applicable
☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
☒ Other (Describe): Testing, inspection, and maintenance of field instruments (water quality meter, MIP instrumentation, and HAPSITE) will be performed in accordance with manufacturers' recommendations. Testing, inspection, and maintenance of analytical instrumentation will be performed in accordance with the previously referenced SOPs and/or manufacturers' recommendations.

2.7 Instrument Calibration and Frequency:

☐ Not Applicable
☒ Inspection/acceptance requirements are in accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
☒ Calibration of laboratory equipment will be performed as described in the previously referenced SOPs and/or manufacturers' recommendations.
☒ Other (Describe): Calibration of field instruments (water quality meter, MIP instrumentation, and HAPSITE) will be performed daily, as described in the manufacturers' recommendations.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables:

☐ Not Applicable
☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
☒ All sample containers will meet EPA criteria for cleaning procedures for low-level chemical analysis. Sample containers will have Level II certifications provided by the manufacturer in accordance with pre-cleaning criteria established by EPA in *Specifications and Guidelines for Obtaining Contaminant-Free Containers.*
☐ Other (Describe):

2.9 Data Acquisition Requirements:

☐ Not Applicable
☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
☒ Previous data/information pertaining to the site (including other analytical data, reports, photos, maps, etc., which are referenced in this QAPP) have been compiled by EPA and/or its contractor(s) from other sources. Some of that data has not been verified by EPA and/or its contractor(s); however, the information will not be used for decision-making purposes by EPA without verification by an independent professional qualified to verify such data/information.
☐ Other (Describe):

2.10 Data Management:

☒ All laboratory data acquired will be managed in accordance with Region 7 EPA SOP 2410.01.
☐ Other (Describe):

Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (July 2007)
for the Atlantic Water Supply Site

3.0 Assessment and Oversight:

3.1 Assessment and Response Actions:

☒ Peer Review ☒ Management Review ☐ Field Audit ☐ Lab Audit

☒ Assessment and response actions pertaining to analytical phases of the project are addressed in Region 7 EPA SOPs 2430.06 and 2430.12.

☐ Other (Describe):

3.1A Corrective Action:

☒ Corrective actions will be taken at the discretion of the EPA Project Manager whenever there appear to be problems that could adversely affect data quality and/or resulting decisions affecting future response actions pertaining to the site.

☐ Other (Describe):

3.2 Reports to Management:

☐ Audit Report ☐ Data Validation Report ☐ Project Status Report ☐ None Required

☒ A letter report describing the sampling techniques, locations, problems encountered (with resolutions to those problems), and interpretation of analytical results will be prepared by Tetra Tech START and submitted to the EPA.
☒ Reports will be prepared in accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
☐ Other (Describe):

4.0 Data Validation and Usability:

4.1 Data Review, Validation, and Verification Requirements:

☐ Identified in attached table:
☒ Data review and verification will be performed in accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
☒ Data review and verification will be performed by a qualified analyst and the laboratory's section manager as described in Region 7 EPA SOPs 2430.06, 2410.10, and 2430.12.

☐ Other (Describe):

4.2 Validation and Verification Methods: ☐ **Identified in attached table.**

☐ Identified in attached table:
☒ The data will be validated in accordance with Region 7 EPA SOPs 2430.06, 2410.10, and 2430.12.
☒ The EPA Project Manager will inspect the data to provide a final review. The EPA Project Manager will review the data, if applicable, for laboratory spikes and duplicates; and laboratory blanks to ensure that they are acceptable. The EPA Project Manager will also compare the sample descriptions with the field sheets for consistency and will ensure that any anomalies in the data are appropriately documented.

☐ Other (Describe):

4.3 Reconciliation with User Requirements:

☐ Identified in attached table:
☒ If data quality indicators do not meet the project's requirements as outlined in this QAPP, the data may be discarded and re-sampling or re-analysis of the subject samples may be required by the EPA Project Manager.

☐ Other (Describe):

Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (July 2007)
for the Atlantic Water Supply Site

Table 1: Sample Summary

Site Name: Atlantic Water Supply Site | **Location:** Atlantic, Iowa

START Project Manager: David Zimmermann | **Activity/ASR #:** To be determined | **Date:** May 2012

No. of Samples	Matrix	Location	Purpose	Depth or other Descriptor	Requested Analysis	Sampling Method	Analytical Method/SOP
35	Water	Geoprobe® temporary monitoring wells and piezometer in the vicinity of previously identified tetrachloroethene (PCE) plume	To identify general extent of PCE plume in groundwater	Temporary wells (about 17 locations) will be sampled at two depths (one at refusal and one at the static water level) estimated at 30 feet and 15 feet below ground surface (ft bgs), respectively. One piezometer will also be sampled, if possible.	On-site VOCs analysis (HAPSITE)	EPA SOPs 4230.07 & 4231.2007	EPA SOP 2318.1
8	Water	Geoprobe® temporary monitoring wells (maximum of 7 locations) and 1 piezometer location	To identify general extent of PCE plume in groundwater	Based on HAPSITE results, selected samples will be submitted for confirmation analysis. Approximately 20 percent of the samples will be submitted for analysis.	VOCs	EPA SOPs 4230.07 & 4231.2007	EPA SOP 3230.13
20 profiles	Soil	Suspected source areas	To identify source(s) and extent of VOC contamination	Readings will be obtained with MIP approximately every foot from ground surface to refusal (35 feet bgs)	On-site VOCs analysis (MIP)	EPA SOP 4230.07	Not assigned
10	Soil	Suspected source areas	To identify source(s) and extent of VOC contamination	Based on MIP results, up to 10 discrete soil samples will be collected at zones exhibiting elevated relative response.	VOCs	EPA SOP 4230.07 & EPA Method 5035	EPA Method 5035
QC Samples							
1	Water	Trip blank	To assess field/transportation-related contamination	NA	VOCs	NA	EPA SOP 3230.13
1	Water	Field blank	To assess field-introduced and laboratory-introduced contamination	NA	VOCs	NA	EPA SOP 3230.13
1	Water	Rinsate blank	To evaluate effectiveness of decontamination procedures for sampling equipment	From monitoring well sampling equipment	VOCs	NA	EPA SOP 3230.13

Region 7 Superfund Program Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (July 2007) for the Atlantic Water Supply Site								
Table 2: Data Quality Objective Summary								
Site Name: Atlantic Water Supply Site				**Location:** Atlantic, Iowa				
START Project Manager: David Zimmermann				**Activity/ASR #:** To be determined			**Date:** May 2012	
Analysis	**Analytical Method**	**Data Quality Measurements**					**Sample Handling Procedures**	**Data Management Procedures**
		Accuracy	**Precision**	**Representativeness**	**Completeness**	**Comparability**		
GROUNDWATER								
VOCs	see Table 1	per analytical method	per analytical method	Biased/judgmental sampling based on professional judgment of the sampling team	100%; samples of on-site groundwater are critical samples.	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.
SOIL								
VOCs	see Table 1	per analytical method	per analytical method	Biased/judgmental sampling based on professional judgment of the sampling team	100%; soil samples from on-site Geoprobe® borings are critical samples.	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.

APPENDIX A

SITE-SPECIFIC INFORMATION FOR A REMOVAL ASSESSMENT AT THE ATLANTIC WATER SUPPLY SITE

INTRODUCTION

The Tetra Tech EM Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has been tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division to conduct Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal assessment activities at the Atlantic Water Supply site in Cass County, Iowa. The site includes a chlorinated solvent groundwater contamination plume that appears to be originating from an abandoned dry cleaners and has impacted a number of municipal wells in Atlantic, Iowa. The site was initially investigated by EPA's pre-remedial program in the late 1980s. Since that time, the site has undergone a number of followup investigations, including a removal assessment in the mid-1990s that involved identification of the source of contamination through installation of 13 Geoprobe® soil borings, and installation and sampling of three permanent monitoring wells. In 2005, a hydrogeologic investigation evaluated the feasibility of installing a permeable reactive barrier wall. During this investigation, six deep borings were advanced with a drill rig to develop a vertical profile of groundwater contamination in the bedrock aquifer near the City's well field. In 2011, a site reassessment determined current groundwater concentrations and reevaluated the site using the Hazard Ranking System. Additional information about previous investigations appears below.

As specified by the START task order and subsequent conversations with the EPA Region 7 Project Manager, this removal assessment will (1) determine if other potential sources of chlorinated solvents are impacting Atlantic Municipal Utility (AMU) municipal wells 7 and 6, (2) estimate the extent of tetrachloroethene (PCE) contamination in soil in the vicinity of monitoring well MW-2, (3) determine the width of the groundwater plume near Troublesome Creek, and (4) determine the stratigraphy of the alluvium and glacial deposits overlying the bedrock. This Quality Assurance Project Plan (QAPP) identifies site-specific features and addresses elements of the sampling strategy and analytical methods proposed for this investigation.

SITE LOCATION/DESCRIPTION

Atlantic is a rural community in the northeastern portion of Cass County, Iowa, located about 75 miles west of Des Moines, Iowa, and 45 miles northeast of Council Bluffs, Iowa. The apparent source of contamination at the Atlantic Water Supply site is located at 1205 East 7th Street, also known as U.S. Highway 6 or State Highway 83 (see Appendix B, Figure 1). A former dry cleaning facility, the Norge Dry Cleaning Village, operated at this location during the 1960s. The approximate coordinates of the former dry cleaner are latitude 41.403718° north and longitude 94.995763° west. Though the exact

dates of operation are not known, the dry cleaning facility was listed in the 1962 Atlantic City Directory (Atlantic, Iowa 1962). This facility also was used from 1960 to 1974 by Shrauger Appliance as an appliance retailing facility. In 1974, the Iowa Department of Transportation (IDOT) leased the site as a materials testing laboratory. IDOT relocated its operation in March 1986 to a site east of the City. It is suspected that the dry cleaning operations and IDOT routinely used solvents (Ecology & Environment, Inc. [E&E] 1988).

Based on the historical aerial photographs of the site (Historical Information Gatherers [HIG] 2003), the building that housed the former dry cleaner/IDOT laboratory facility was razed between 1982 and 1994. The area is now owned by the Rolling Hills Bank and Trust. A Burger King restaurant is located about 300 feet east of the former dry cleaning location. Land use surrounding the site is a mix of commercial and residential properties. The City of Atlantic's municipal well field is located approximately 0.50 mile northwest of the former dry cleaner location.

The municipal water supply well field in Atlantic, Iowa, has been impacted by PCE (also known as perchloroethylene) (Terra Tech 2004). At the source, approximately 40 feet of silt and clay overlies fine- to coarse-grained friable sandstone from which the well field withdraws the City's potable water supply. The silt and clay soils have been contaminated with PCE that has migrated to the underlying sandstone aquifer used by the City of Atlantic for its municipal water supply.

The PCE contamination continues to migrate downward into the sandstone aquifer, and then to travel horizontally within this aquifer to the City's municipal well field. The well nearest to the source area (AMU Well No. 7) was first found to contain PCE in 1982 (reported at a concentration of 170 micrograms per liter [µg/L]) (E&E 1988). AMU Well No. 7 was disconnected from the system and is now pumped continually by the local water authority wastewater treatment plant in order to provide hydraulic control and protect nine other municipal wells from contamination. Currently, nine active municipal wells serve the 7,200 citizens of Atlantic, Iowa. Eight municipal wells (AMU Well Nos. 10 through 17) are located on the north side of Troublesome Creek between 0.5 and 1 mile from the former dry cleaner site (Figure 2, Appendix B). AMU Well Nos. 6 and 7 are located on the south side of the creek. For the nine active municipal wells, total depths range from approximately 75 to 98 feet below ground surface (bgs), with an average of 87 feet bgs (AMU well data). Other wells previously present on the south side of the creek (AMU Well Nos. 1 through 5 and 8 and 9) have since been decommissioned due to their age and diminishing performance. Well No. 6, located approximately 910 feet northeast of Well No. 7, is also slightly contaminated with PCE (approximately 5 µg/L or less), which signifies the overall width of the PCE contaminant plume. AMU well 6 is still used as a drinking water well and is

pumped approximately 15 to 20 hours per day at 300 to 350 gallons per minute (gpm) on average. Water from the nine active municipal wells is initially blended and then treated. Prior to distribution, the water is treated primarily with liquid chlorine, used to disinfect the water, and fluorosilicic acid (H_2SiF_6), for water fluoridation. Hydrochloric acid is additionally used for well maintenance and rehabilitation for removal of mineral scale.

PREVIOUS INVESTIGATIONS

During a water quality survey by the Iowa Department of Natural Resources (IDNR) in August 1982, PCE was detected in AMU Well No. 7 (AMU-7) at a concentration of 170 µg/L. Subsequent IDNR sampling events detected PCE in AMU-7 at concentrations ranging from 11 µg/L in March 1995 (IDNR 1999) to 260 µg/L in August 1984 (E&E 1988). The maximum contaminant level (MCL) for PCE is 5 µg/L. From August 1982 to November 1987, water from AMU-7 was pumped at a rate of 80 gpm to Buttermilk Creek in an attempt to prevent migration of the PCE contamination to other nearby drinking water supply wells (E&E 1988). In December 1987, the discharge from AMU-7 was rerouted to the 3rd Street sanitary sewer line about 150 feet southwest of the well for treatment at the City of Atlantic's wastewater treatment facility (E&E 1988).

In August 1987, an EPA contractor conducted a soil gas survey to delineate the approximate extent of PCE contamination. Soil gas samples were collected from a depth of 5 to 6 feet bgs at 55 locations, beginning at the former dry cleaners and IDOT laboratory facility, and proceeding in the direction of groundwater flow (north-northwest) toward the AMU well field. Analytical results suggested the source area was just south of East 7th Street, about 250 feet east of the former dry cleaning and IDOT laboratory facility (E&E 1988). The report stated that a release of PCE likely had occurred at the former dry cleaning and IDOT laboratory facility, and had migrated via surface runoff and groundwater flow to this topographic low near the former location of a Hardee's restaurant. According to the report, the migration of PCE from the source area may have followed the storm sewer system along the southern side of East 7th Street (E&E 1988).

In August and November 1998, IDNR conducted followup investigations of the PCE contamination to better define the source. During these investigations, 34 soil gas samples and 10 soil samples were collected for analysis. IDNR analyzed the soil samples for PCE utilizing a mobile laboratory and using a headspace analysis method. The sampling focused on the area of the former dry cleaning and IDOT laboratory facility, and the source area identified during the 1987 EPA investigation. Soil gas data from the IDNR investigations confirmed the level of PCE contamination originally detected near the former

Hardee's restaurant. However, significantly higher PCE levels (greater than 10,000 parts per million) were detected near the former dry cleaning and IDOT laboratory facility. Based on these findings, IDNR concluded that contamination in the silty, clayey soil beneath the former dry cleaning and IDOT laboratory facility is the predominant source of PCE impacting the groundwater (IDNR 1999). The report indicated that soils appeared to be contaminated to a depth of at least 20 feet bgs. The report also recommended installing monitoring wells to better define the extent of PCE contamination in groundwater near the suspected source area.

From 2002 through 2004, Tetra Tech START conducted a removal site evaluation (RSE) of the Atlantic Water Supply site. Field activities included advancement of 13 soil borings to depths ranging from 23 to 36 feet bgs (Tetra Tech 2004). These borings were advanced around the previously identified source area and sampled to aid in determining the extent of contamination. In addition, three permanent, flush-mounted monitoring wells were installed into the Dakota Sandstone Formation at depths ranging from 40.5 to 50 feet bgs. These wells were installed to assess groundwater quality near the source area. In soils, PCE was reported at its highest concentrations near MW-2, installed near the former dry cleaner. At this location, PCE was found at concentration above the preliminary remediation goal (PRG) of 3,400 micrograms per kilogram (µg/kg) in samples collected from 19 to 36 feet bgs. This was the only soil boring with PCE levels above the PRG. Of the three monitoring wells installed, MW-2 was the only one containing PCE in groundwater at concentrations greater than 1 µg/L. PCE was reported at a maximum concentration of 5,300 µg/L in this well in July 2003 (Tetra Tech 2004).

In 2005, personnel from the EPA Environmental Response Team (ERT) and the Response Engineering and Analytical Contract (REAC) conducted a hydrogeologic investigation at the site (Lockheed Martin Technology Services 2005). The primary purpose of the investigation was to define the nature and extent of groundwater contamination upgradient of the municipal well field in order to assess the applicability of installing a permeable reactive barrier (PRB) for groundwater treatment and protection. As part of the investigation, six boreholes were installed about 150 feet upgradient (south) of contaminated AMU Well No. 7 at the approximate centerline of the proposed PRB wall. Borehole depths ranged from 76 to 87.5 feet bgs, and were installed into the upper sandstone bedrock using sonic drilling techniques. Multiple groundwater samples were collected at each boring, beginning at about 20 to 25 feet bgs, and then at 20-foot intervals as the borings were advanced. In all, 28 groundwater samples were collected. PCE was reported in water samples from all six borings, with the highest concentration (446 µg/L) found in the boring farthest east (Lockheed Martin Technology Services 2005). The eastern extent of the plume near the well field was not delineated in that investigation, and remains undefined. Following the

investigation, preliminary cost estimates to install a PRB were calculated. The total costs for this remedial technology were prohibitive to implement under the removal program.

In December 2011, as part of a site reassessment, START collected groundwater samples from three monitoring wells near the source (Tetra Tech 2012). Groundwater samples were also collected from nine active municipal wells and a former municipal well (AMU-7) that is now pumped to waste to contain the plume. PCE (2,500 µg/L) and *cis*-1,2-dichloroethene (3.8 µg/L) were identified in samples collected from MW-2 at the former dry cleaners at 1205 East 7th Street. In AMU-7, PCE and trichloroethene (TCE) were reported at 87 and 1.3 µg/L, respectively. Concentrations have decreased with time in both the monitoring well and at AMU-7, but remain well above health-based benchmarks. The only active municipal well that contained any site-related contaminants was AMU-6, where PCE was reported at 3.6 µg/L. AMU-6 is approximately 950 feet northeast of AMU–7. PCE was reported at concentrations above the 1.6 µg/L cancer risk (CR) benchmark screening concentration from Superfund Chemical data Matrix in samples from on-site monitoring well MW-2, the former municipal well AMU-7, and the active municipal well AMU-6. The MCL for PCE was exceeded in MW-2 and AMU-7. TCE concentrations detected in AMU-7 also exceeded the 0.21 µg/L CR benchmark screening level.

ENVIRONMENTAL SETTING

Sources of groundwater in the area of Cass County include alluvial valley aquifers, glacial-drift aquifers, and the Dakota Formation (U.S. Geological Survey [USGS] 1992). The alluvial aquifers are primarily made up of deposits along existing river valleys. The nearest alluvial valley to Atlantic is the east fork of the Nishnabotna River and its tributary, Troublesome Creek. The aquifer underlying the valley is relatively shallow, with an average depth of 21 feet, and is composed of fine-grained alluvial deposits. The thickness ranges from approximately 2 to 43 feet. Groundwater can also be obtained from shallow glacial-drift aquifers, consisting of glacial and loess deposits over bedrock. In the Atlantic area, these deposits range in thickness from 18 to 260 feet. Although the water table is usually shallow, production rates in the glacial-drift aquifers are often limited due to low soil permeability. Neither the alluvial nor the glacial drift aquifers are used for groundwater production in the Atlantic area.

The City of Atlantic draws its water solely from the Nishnabotna Member of the Dakota Formation. The Dakota is a fine- to coarse-grained sandstone, very poorly cemented (friable), partly pebbly to conglomeratic, and locally interbedded with seams of clay (IDNR 1996). Secondary lithologies include chert-quartz gravel, conglomerate, and gray to variegated mudstone with some siderite pellets. The formation is approximately 40 to 60 feet thick in the Atlantic wellhead protection area, providing

abundant pore space for groundwater storage. Within the wellhead protection area, the Dakota is upwardly confined by clay-rich glacial till.

The aquifer is recharged by downward percolation through Pleistocene deposits and by lateral groundwater inflow from southwest Minnesota. Regional groundwater flow is from north to south, and natural discharge from the aquifer occurs into the lower reaches of major rivers in the region. Locally, groundwater flows from south to north (the direction of PCE migration), which results from a combination of topography and groundwater pumping from the municipal well field.

Measured static water levels (SWL) from past investigations are as follows. In monitoring wells MW-1 and MW-2, installed south of U.S. Highway 6 (White Pole Road) in the parking lots for the Burger King and former dry cleaners, SWL was 35.9 feet below top of casing (btoc) in MW-1 and 40.16 feet btoc in MW-2 in September 2002. In MW-3, located approximately 450 feet north of MW-1, SWL in September 2002 was 27.69 feet btoc. According to wells logs, the SWL in MW-1 and MW-2 was in the Dakota Sandstone. In MW-3, SWL was about 7 feet above the Dakota Sandstone in a fat clay. It is not clear if the groundwater occurred in the clay or if the Dakota water was under artesian pressure. When measured in December 2011, as part of the site reassessment, the SWLs in the monitoring wells had risen between 4.22 feet in MW-3 to 5.18 feet in MW-2.

Closer to Troublesome Creek, SWLs are above the Dakota Sandstone. In the six borings installed as part of the 2005 hydrogeologic investigation, SWL was reported at approximately 1,135 feet above mean sea level, or about 22 feet bgs. In this area, the saturated thickness of the alluvium above the Dakota sandstone was from 10 to 15 feet.

Average hydraulic characteristics of the Dakota Formation in the wellhead protection area are as follows (USGS 1992):

- Transmissivity = 1,750 to 3,075 square feet per day
- Hydraulic conductivity = 35 to 60 feet per day
- Hydraulic gradient = 0.003 feet per foot.

Below the Dakota is an aquiclude of impermeable, calcareous, gray-blue-red shales, with interbedded limestones, belonging to the Missourian Series of Pennsylvanian age. These shales are encountered at a depth of 85 to 90 feet bgs and are approximately 725 feet thick in the Atlantic area.

SAMPLING STRATEGY AND METHODOLOGY

The sampling activities are tentatively scheduled to begin in June 2012, and will require approximately 2 weeks to complete. The laboratory data obtained for all samples collected during this project will be compared to applicable or relevant and appropriate requirements (ARAR) to assess whether further response is warranted.

Groundwater Sampling

To determine the source(s) and extent of the volatile organic compounds (VOC) contamination in the vicinity of the municipal water supply wells, groundwater samples will be collected from up to 17 temporary wells installed with direct-push technology (DPT). At each DPT location, groundwater will be collected from two depths: the first at refusal, anticipated from 25 to 30 feet bgs and corresponding with the overburden/bedrock interface; and the second depth at the top of the water table, about 15 feet bgs. Tentative sample locations are illustrated on Figure 3 in Appendix B.

Thirteen DPT wells will be placed east and west of the borings installed in 2005. Moving east from former location B-5, five wells will be installed every 100 feet along the south side of the railroad tracks. The sixth well location will be 200 feet east of the fifth, and the seventh location will be 400 feet east of the sixth. Moving west of former boring location B-6, six well locations will be placed every 100 feet on the south side of East 3rd Street. See Figure 3 in Appendix B for proposed DPT well locations. All DPT groundwater samples will be analyzed for VOCs on site with a HAPSITE field portable gas chromatograph/mass spectrometer (GC/MS). Based on the HAPSITE results, proposed DPT locations, total depths, or sample intervals may be adjusted during field activities. Initial sampling will begin at the outermost probe locations (east and west), and proceed inward toward AMU-7. Figure 3 shows 13 potential temporary well locations for evaluating the extent of the PCE groundwater plume. Approximately 26 groundwater samples from multiple intervals are anticipated for on-site analysis using the HAPSITE.

In addition to these 13 locations, two DPT well locations are proposed between AMU-7 and the suspected source area. At these locations groundwater will be sampled from two depths if it occurs above bedrock. Moreover, two DPT well locations (two sample depths each) will be reserved to investigate other former dry cleaners located upgradient of the City's well field to determine if other sources may be contributing to the groundwater plume. As well as sampling groundwater at these four locations, START will also perform electrical conductivity logging to determine the lithology of the unconsolidated material.

Samples from temporary wells will be collected with a Geoprobe® Screen Point 15 sampling apparatus containing either disposable, 4-foot-long, polyvinyl chloride (PVC) screens or a Geoprobe® reusable stainless steel screen. At each location, the sampler will be advanced to the maximum depth (anticipated at approximately 30 feet bgs); then the screen will be exposed to the aquifer. After the screen is deployed at the bottom of the boring, a sample will be collected through disposable polyethylene tubing utilizing a check valve placed at the bottom of the tubing. The rod string will then be lifted to the other interval, and the screen and tubing will be purged with groundwater from each interval prior to sampling. About 1 gallon of water will be purged from the well prior to sampling at each interval. At each sampled interval, one unpreserved, 40-milliliter (mL) vial will be collected for HAPSITE analysis by EPA personnel. Four 40-mL vials preserved with hydrochloric acid (HCl) will also be collected for possible confirmation analysis by the EPA Region 7 laboratory. Samples will be selected for confirmation analysis based on results obtained by the HAPSITE. At least 20 percent of the samples analyzed on site will be split for confirmation analysis by the EPA Region 7 laboratory. The groundwater sampler and rods will be decontaminated between locations, and new tubing will be used at each well location. No more than seven samples from temporary wells will be submitted to the laboratory for analysis for low-level VOCs.

One groundwater sample from a piezometer located near the Atlantic wastewater treatment facility will be collected. The depth of the piezometer is unknown; therefore, START will measure the depth using a weighted tape. Static water level will be measured with an electronic water level indicator. Temperature, pH, specific conductivity, and turbidity will be monitored and recorded during purging. Purging will continue until these parameters have stabilized (until a difference of less than 0.2 pH units and less than a 10 percent change for all other parameters is observed among three consecutive readings). The groundwater sample will be collected after bailing or pumping (using an electric submersible pump) a minimum of three well volumes of water from the piezometer. A water sample submitted for VOCs analysis by the EPA Region 7 laboratory will be collected in four 40-mL vials and preserved with HCl to a pH <2. An unpreserved 40-mL vial may also be collected for on site HAPSITE analysis by EPA personnel.

A field sheet will be completed for each sample submitted for Region 7 laboratory analysis. The field sheets will include the following information: water quality parameters, purge times or estimated purge volumes, property ownership information, exact sample locations (depths and global positioning system coordinates), and analyses to be performed. All water samples will be stored in coolers maintained at or below a temperature of 4 degrees Celsius (°C) pending submittal to the EPA Region 7 laboratory.

A summary of all anticipated samples for this project is in Table 1 of the attached QAPP form. A summary of data quality objectives for this project is in Table 2 of the attached QAPP form. The standard operating procedures (SOP) and chain-of-custody procedures referenced in the QAPP will be followed throughout the sampling activities to verify the integrity of the samples from the time of collection until they are submitted to the laboratory for analysis.

Disposal of investigation-derived wastes (IDW) and procedures for equipment and personal decontamination will be addressed in a site-specific health and safety plan prepared by Tetra Tech START. IDW is expected to consist of disposable sampling supplies (gloves, paper towels, etc.) that will be disposed of off site as uncontaminated solid waste. Purge water from the piezometer will be containerized and disposed of at the Atlantic wastewater treatment facility.

Soil Sampling

Soil samples will be collected from suspected source areas identified during the 2002 - 2004 RSE. During that investigation, PCE was reported in soils collected from the boring for MW-2 at concentrations ranging from 930 to 5,200 µg/kg. Contamination increased with depth, with the maximum concentration measured at about 36 feet bgs where refusal was encountered. Lesser concentrations of PCE (23 to 37 µg/kg) were reported in soil samples collected from DPT borings GP-1 and GP-4, located approximately 70 feet south-southeast and 90 feet southeast of MW-2, respectively. In order to better delineate the nature and extent of contaminated soil in the vicinity of MW-2, a gridded sampling approach in the parking lot surrounding MW-2 will be followed. A grid with 5.5 yard nodes will be established around MW-2. The grid is anticipated to be 22 yards east/west and 16.5 yards north/south for a total of 20 nodes (see Figure 4 in Appendix B). At each node, a 2-inch-diameter hole will be drilled through the concrete pavement. Once the hole through the concrete is established, the EPA Geoprobe will be used to advance the Membrane Interface Probe (MIP) tool through the subsurface soil to obtain a continuous log of chlorinated VOCs in soil. The MIP is a heated probe carrying a permeable membrane that is advanced to depth in the soil. VOCs in the subsurface cross the membrane, enter into a carrier gas stream, and are carried to a detector at the surface for measurement. The MIP is a screening tool to find the depth at which contamination is located, but is not necessarily used to accurately quantify concentrations of compounds. Along with the detection of VOCs in the soil, the MIP also measures the electrical conductivity of the soil to indicate a probable lithology of the subsurface materials.

Based on the relative response from the MIP survey, soil cores will be collected using Geoprobe® macro-core soil samplers with a stop-pin system. Discrete intervals exhibiting elevated detections from

the MIP survey will be sampled for laboratory analysis for VOCs in accordance with EPA SW-846 Method 5035. Separate boreholes will be required for collection of soil samples for laboratory analysis. The boreholes at which the macro-core samplers will be advanced will be located within 1 foot of where the MIP logs had been obtained. Samples for laboratory analysis will consist of two 5-gram aliquots placed in two 40-mL vials preserved with sodium bisulfate, and two unpreserved 40-mL vials packed with soil. At up to 10 boring locations, a soil sample will be collected at the depth corresponding to the maximum VOC concentration logged by the MIP. These locations will be selected so that an approximate area of contaminated soil can be delineated, and MIP relative response logs can be compared against fixed laboratory quantitative results. The DPT soil samples will be collected in accordance with EPA Region 7 SOP 4230.07: Geoprobe® Operations. All soil samples will be stored in coolers maintained at or below 4 degrees °C pending submittal to the EPA Region 7 laboratory.

Quality Control Samples

To evaluate sample quality control (QC), a water trip blank, rinsate blank, and field blank will be collected, as specified in Section 2.5 of the QAPP form.

ANALYTICAL METHODS

Water and soilsamples will be submitted to the EPA Region 7 laboratory in Kansas City, Kansas, for analysis. The samples will be analyzed for VOCs in accordance with SOPs and methods referenced in the QAPP. Standard turnaround times and detection limits for those methods will be adequate for this project. Appropriate containers and physical/chemical preservation techniques will be employed during the field activities to help verify that representative analytical results are obtained. An Analytical Services Request form will be completed by the Tetra Tech START Project Manager and submitted to the EPA Region 7 laboratory. Submittal of samples to the laboratory is expected in June 2012.

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APPENDIX B

FIGURES

E 7TH ST

GP-13

MW-2

GP-3

GP-4

GP-1

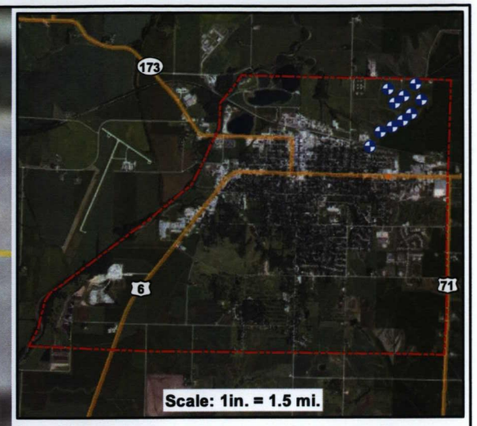
1 2 3 4 5

A

B

C

D



Legend

- Geoprobe® location - 2002
- Monitoring well location - 2002
- Proposed soil sample location
- Street
- Sample grid

N

0 10 20

Feet

Source: Bing Maps Aerial Imagery Web Mapping Service, 2011;
HSIP Gold, 2007;
Iowa Department of Natural Resources, GIS Library,
Contours 2ft Data, 2010;
Snyder and Associates, 4/4/99;
U.S. EPA Environmental Response Team,
Response Engineering and Analytical Contract,
Figure 1, Atlantic Iowa Groundwater PCE, 2005.

Atlantic Water Supply Site
Atlantic, Iowa

Figure 4
Proposed Soil Sampling Locations Map

TETRA TECH EM INC.

Date: 5/30/2012 Drawn By: Gustavo Orozco Project No: X9004.L.12.0278.000

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Legend

- Borehole location - 2005
- Geoprobe® location - 2002
- Monitoring well location - 2002
- Public water supply well location
- Proposed Geoprobe® groundwater sample location
- Contour
- Major road
- Street
- Approximate location of former dry cleaner/ IDOT laboratory

N

0 105 210

Feet

Source: Bing Maps Aerial Imagery Web Mapping Service, 2011; HSIP Gold, 2007; Iowa Department of Natural Resources, GIS Library, Contours 2ft Data, 2010; Snyder and Associates, 4/4/99; U.S. EPA Environmental Response Team, Response Engineering and Analytical Contract, Figure 1, Atlantic Iowa Groundwater PCE, 2005.

Atlantic Water Supply Site
Atlantic, Iowa

Figure 3

Proposed Groundwater Sampling Locations Map

TETRA TECH EM INC.

Date: 5/25/2012 Drawn By: Gustavo Orozco Project No: X9004.L.12.0278.000

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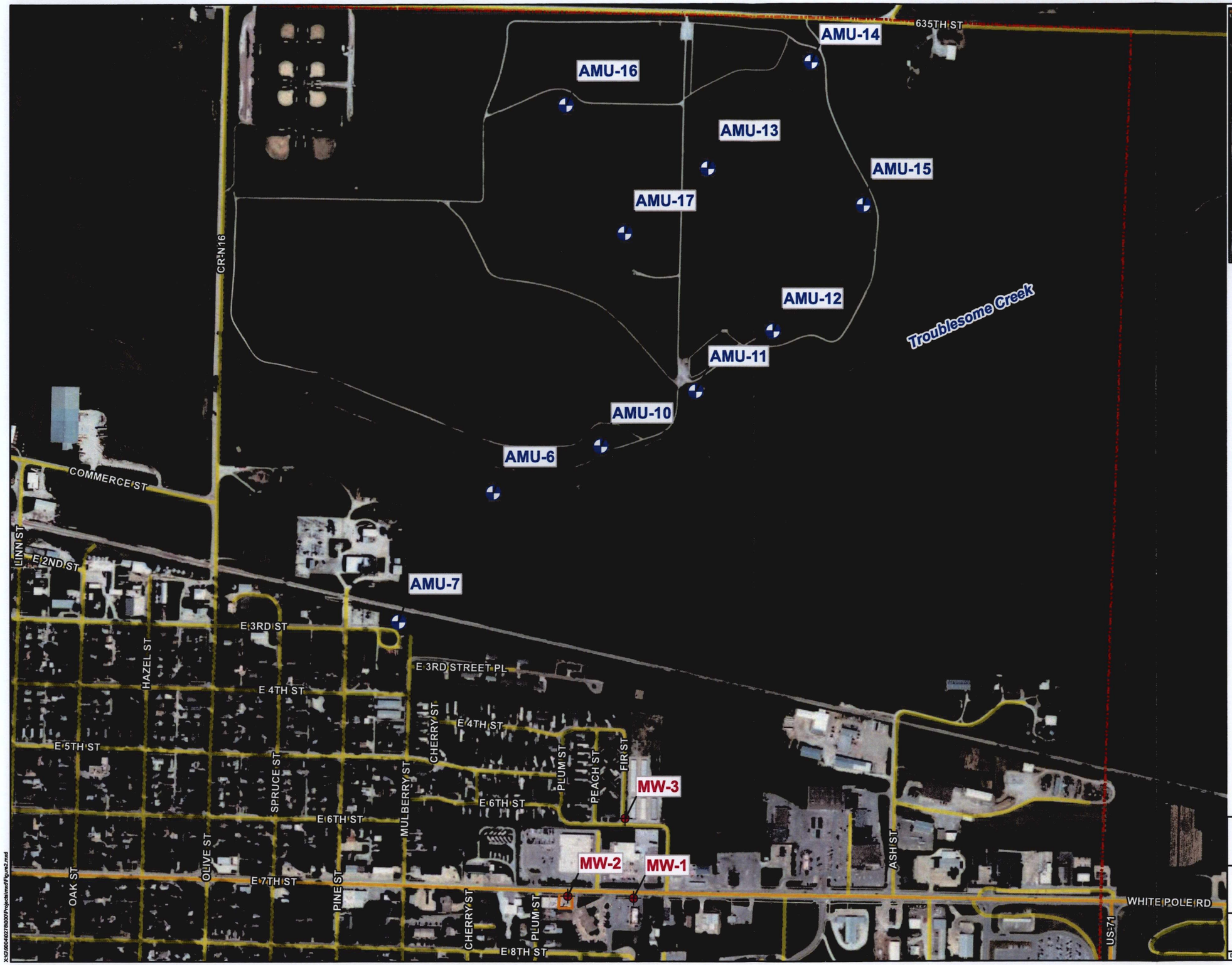

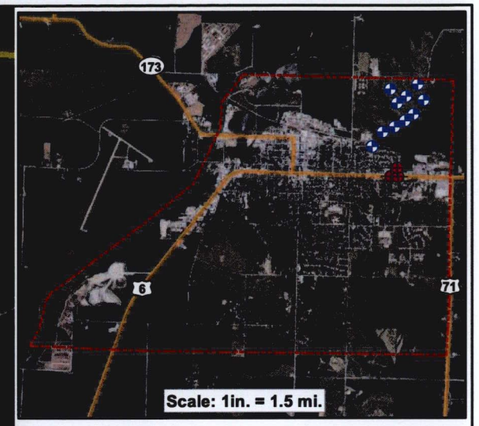

Legend

- Public water supply well
- Monitoring well
- Major road
- Street
- Approximate location of former dry cleaner/ IDOT laboratory
- City boundary

N

0 275 550

Feet

Source: Bing Maps Aerial Imagery Web Mapping Service, 2011

Atlantic Water Supply Site
Atlantic, Iowa

Figure 2
Atlantic Well Field Map

TETRA TECH EM INC.

Date: 5/30/2012 Drawn By: Bill Spiking Project No: X9004.L.12.0278.000

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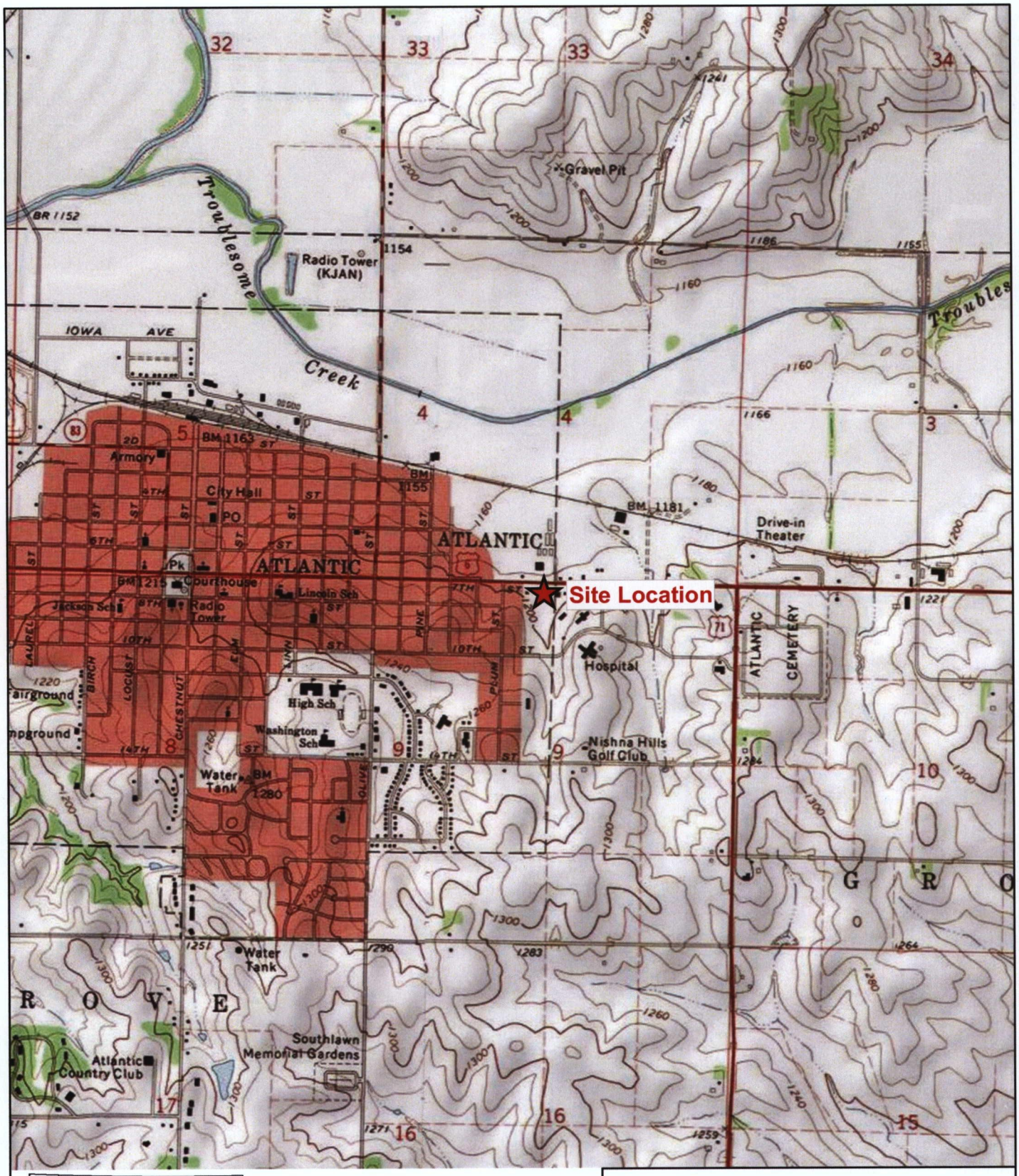

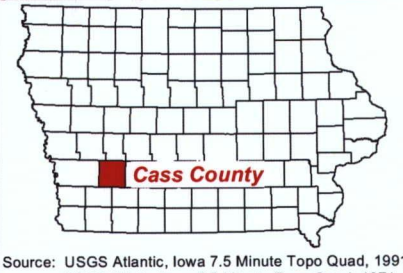

N

0 1,000 2,000

Feet

Source: USGS Atlantic, Iowa 7.5 Minute Topo Quad, 1991
USGS Wiota, Iowa 7.5 Minute Topo Quad, 1971

X:\GIS\9004\0278\000\Projects\mxd\Figure1.mxd

Atlantic Water Supply Site
Atlantic, Iowa

Figure 1
Site Location Map

TETRA TECH EM INC.

Date: 5/25/2012 Drawn By: Bill Spiking Project No: X9004.L.12.0278.000